AMENDMENTS TO THE CLAIMS

Please amend claims 1, 15, 48 and 49, as set forth in the following listing of claims, which will replace all prior versions, and listings, of claims in the present application.

Listing of Claims

1. (Currently Amended) A method of forming a fluid interface port in a microfluidic system, comprising:

forming at least a portion of a microchannel in a substrate, the microchannel having a diameter, and

forming a fluid interface port in a side wall of the microchannel along a length of the microchannel, the fluid interface port having a constant depth extending from an outer surface of the side wall to an inner surface of the side wall ~~equal to a thickness of the side wall~~ and a diameter ~~that is significantly larger than the depth and~~ between 25 μm and about 100 μm, wherein the depth of the fluid interface port is significantly smaller than the diameter of the fluid interface port, and the diameter of the microchannel is larger than the diameter of the fluid interface port, so as to form a virtual wall therein when the microchannel is filled with a liquid, wherein the virtual wall comprises a meniscus that is substantially co-planar with the side wall in which the virtual wall is formed, and has a dead volume that is less than about one nanoliter.

2. (Original) The method of claim 1, wherein the step of forming the microchannel comprises the steps of

forming a partially open channel having an open top portion, and

covering the partially open channel to form the microchannel.

3. (Original) The method of claim 2, further comprising the step of providing a cover to cover the partially open channel.

4. (Original) The method of claim 3, wherein the fluid interface port is formed in the cover.

5. (Original) The method of claim 2, further comprising the step of stacking a cover for covering the partially open channel and the substrate together to form a microfluidic structure having a microchannel.

6. (Original) The method of claim 1, further comprising the step of forming a second fluid interface port having suitable dimensions to form a second virtual wall.

7. (Original) The method of claim 1, further comprising the step of forming an array of fluid interface ports.

8. (Original) The method of claim 1, further comprising the step of providing a hydrophobic patch in the microchannel.

9. (Previously presented) The method of claim 8, wherein the step of providing the hydrophobic patch comprises the step of disposing the hydrophobic path at a position in the microchannel that is substantially coaxial with the fluid interface port.

10. (Original) The method of claim 9, wherein the step of providing the hydrophobic patch comprises introducing a hydrophobic material through the fluid interface port.

11. (Original) The method of claim 1, further comprising the step of forming a plurality of microchannels in the substrate.

12. (Original) The method of claim 1, further comprising the step of forming a non-linear microchannel in the substrate.

13. (Original) The method of claim 1, further comprising the steps of
forming at least partially one or more microchannels in the substrate,
forming one or more reservoirs in a second substrate,
disposing the substrate in the second substrate,
disposing a cover over the substrate to form the microchannel, and
forming one or more of the fluid interface ports in the cover.

14. (Previously presented) A microfluidic system formed according to the method of claim 1.

15. (Currently Amended) A microfluidic structure, comprising

a substrate,

one or more microchannels formed in the substrate, each diameter having a diameter,

a cover for covering the microchannel, wherein said microchannel includes a side wall, and

one or more fluid interface ports formed in the cover along the length of the microchannel to provide a direct interface between an interior of the microchannel and an exterior of the microfluidic structure, wherein each fluid interface port has a constant depth extending from an outer surface of the cover to an inner surface of the cover ~~equal to a thickness of the cover~~ and a diameter ~~that is significantly larger than the depth and~~ between about 25 μm and about 100 μm, wherein the depth of the fluid interface port is significantly smaller than the diameter of the fluid interface port, and the diameter of the fluid interface port is smaller than the diameter of an associated microchannel in which the fluid interface port is formed, so that a virtual wall is formed in the fluid interface port when a fluid is disposed in the microchannel, wherein the virtual wall comprises a meniscus that is substantially co-planar with the side wall in which the virtual wall is formed, and has a dead volume that is less than about one nanoliter.

16. (Original) The structure of claim 15, wherein said cover comprises multiple layers.

17. (Original) The structure of claim 15, wherein said cover comprises a single layer.

18. (Original) The structure of claim 15, further comprising a filling aperture formed in the cover.

19. (Original) The structure of claim 15, further comprising a venting aperture formed in the cover.

20. (Previously presented) The structure of claim 15, further comprising a hydrophobic patch disposed in the microchannel.

21. (Original) The structure of claim 15, further comprising a stopper aperture formed in the cover.

22. (Original) The structure of claim 15, wherein the fluid interface port is selected from the group consisting of a stopper aperture, a filling aperture, and a venting aperture.

23. (Canceled)

24. (Original) The structure of claim 22, further comprising a cover for covering and sealing the filling aperture.

25. (Original) The structure of claim 15, further comprising a covering layer disposed in the fluid interface port.

26. (Previously presented) The structure of claim 25, wherein the covering layer is immiscible with a fluid disposed in the microchannel.

27. (Previously presented) The structure of claim 25, wherein the covering layer prevents evaporation of a liquid disposed in the microchannel through the fluid interface port.

28. (Previously presented) The structure of claim 25, wherein the covering layer prevents evaporation of a liquid disposed in the microchannel through the fluid interface port, while allowing injection of a second fluid into the microchannel through the covering layer.

29. (Original) The structure of claim 15, further comprising a material disposed on a wall of the port for interacting with a fluid in the microchannel.

30. (Original) The structure of claim 15, further comprising a plurality of fluid interface ports.

31. (Original) The structure of claim 30, wherein at least two of said plurality of fluid interface ports are disposed relative to another to extend across a diameter of the microchannel.

32. (Original) The structure of claim 30, wherein at least two of said plurality of fluid interface ports are disposed relative to another to extend axially along a length of the microchannel.

33. (Original) The structure of claim 15, wherein the microchannel is non-linear.

34. (Original) The structure of claim 15, wherein the microchannel is U-shaped.

35. (Original) The structure of claim 15, further comprising one or more reactors coupled to the microchannel for effecting a chemical reaction in the microchannel.

36. (Original) The structure of claim 15, further comprising a liquid injection system for injecting a fluid into the microchannel.

37. (Original) The structure of claim 15, further comprising a liquid ejection system for ejecting a liquid from the microchannel.

38. (Original) The structure of claim 15, further comprising a heater disposed in the microchannel.

39. (Original) The structure of claim 15, further comprising a gas pressurizer coupled to the structure.

40. (Original) The structure of claim 15, further comprising a pressure pulse generator for applying a pressure pulse to a fluid when disposed in the microchannel to eject a droplet of the fluid from the fluid interface port.

41. (Original) The structure of claim 40, wherein the pressure pulse generator comprises a second virtual wall disposed coaxially with the virtual wall, and a gas pressurizer in communication with the second virtual wall.

42-47 Canceled.

48. (Currently Amended) A microfluidic structure, comprising

a substrate,

one or more microchannels formed in the substrate, each microchannel having a diameter,

a cover for covering the microchannel, wherein said microchannel includes a side wall, and

one or more fluid interface ports formed in the cover along the length of the microchannel to provide a direct interface between an interior of the microchannel and an exterior of the microfluidic structure, wherein each fluid interface port is substantially disk-shaped, with a constant depth extending from an outer surface of the cover to an inner surface of the cover ~~equal to a thickness of the~~ cover and a diameter ~~that is significantly larger than the depth and~~ between about 25 μm and about 100 μm, wherein the depth of the fluid interface port is significantly smaller than the diameter of the fluid interface port, and the diameter of the microchannel is larger than the diameter of the fluid interface port, so that a virtual wall is formed in the fluid interface port when a fluid is disposed in the microchannel, wherein the virtual wall comprises a meniscus that is substantially co-planar with the side wall in which the virtual wall is formed, and has a dead volume that is less than about one nanoliter.

49. (Currently Amended) A method of forming a fluid interface port in a microfluidic system, comprising:

forming at least a portion of a microchannel in a substrate, the microchannel having a diameter, and

forming a disk-shaped fluid interface port in a side wall of the microchannel along a length of the microchannel, the fluid interface port having a constant depth extending from an outer surface of the sidewall to an inner surface of the side wall ~~equal to a thickness of the side wall~~ and a diameter ~~that is significantly larger than the depth and~~ between 25 μm and about 100 μm, wherein the depth of the fluid interface port is significantly smaller than the diameter of the fluid interface port, and the microchannel diameter is larger than the diameter of the fluid interface port so as to form a virtual wall therein when the microchannel is filled with a liquid, wherein the virtual wall comprises a meniscus that is substantially co-planar with the side wall in which the virtual wall is formed, and has a dead volume that is less than about one nanoliter.